CLAIMS

1. (Currently amended) A method for deinterlacing a video source comprising:

filtering a 2-dimensional array of image elements surrounding a pixel location resulting in a filtered set of data wherein the 2-dimensional array of image elements are all from a temporally current field;

detecting an edge in an image based on the filtered set of data;

detecting an orientation of ~~image~~the edge ~~features~~in the image based on the filtered set of data; and

calculating a new pixel based on the orientation of ~~image~~the edge ~~features~~in the image.

2. (Canceled)

3. (Currently amended) The method of claim [[2]]1 wherein a significant null or minimum in the set of filtered data indicates a presence and an orientation of the edge in the image.

4. (Original) The method of claim 3 wherein the 2-dimensional array of image elements is characterized to invalidate a false edge detection by determining a number of similar edge orientations and a number of dissimilar edge orientations in an area around each edge detection and passing any remaining edge detections in the image through a set of smoothing filters to produce a final edge detection value for each source image pixel location.

5. (Currently amended) method of claim [[2]]1 wherein the filtered set of data is obtained at a plurality of angles surrounding the pixel location relative to a horizontal.

6. (Original) The method of claim 5 wherein the plurality of angles is comprised of 90°, 0°, -15°, 15°, -30°, 30°, -45°, 45°, -60° and 60° angles.

7. (Currently amended) ~~The method of claim 6~~A method for deinterlacing a video source comprising:

detecting an edge in an image;

detecting an orientation of image edge features;

calculating a new pixel based on the orientation of image edge features; and

filtering a 2-dimensional array of image elements surrounding a pixel location resulting in a filtered set of data wherein the filtered set of data is obtained at a 90°, 0°, -15°, 15°, -30°, 30°, -45°, 45°, -60° and 60° angles surrounding the pixel location relative to a horizontal, wherein the filtered set of data is obtained for the 90°, -15°, 15°, -30°, 30°,-45°,45°,-60° and 60° angles by:

a) obtaining a first previous pixel location, a first pixel location and a first next pixel location adjacent to a first side of the pixel location along a current angle relative to the horizontal;

b) obtaining a second previous pixel location, a second pixel location and a second next pixel location adjacent to a second side of the pixel location along the current angle relative to the horizontal;

c) quartering the first previous pixel location and the first next pixel location; halving the first pixel location;

b) summing up the quartered first previous pixel location and the quartered first next pixel location;

c) subtracting the sum of the quartered first previous pixel location and the quartered first next pixel location from the halved first pixel location resulting in a first high pass filter output;

d) quartering the second previous pixel location and the second next pixel location;

e) halving the second pixel location;

f) summing up the quartered second previous and the quartered second next pixel location;

g) subtracting the sum of the quartered second previous and the quartered second next pixel location from the halved second pixel location resulting in a second high pass filter output; and

h) averaging a magnitude of the first high pass filter output and a magnitude of the second high pass filter output resulting in a final highpass filter output for the current angle.

8. (Currently amended) ~~The method of claim 6~~A method for deinterlacing a video source comprising:

detecting an edge in an image;

detecting an orientation of image edge features;

calculating a new pixel based on the orientation of image edge features; and

filtering a 2-dimensional array of image elements surrounding a pixel location resulting in a filtered set of data wherein the filtered set of data is obtained at a 90°, 0°, -15°, 15°, -30°, 30°, -45°, 45°, -60° and 60° angles surrounding the pixel location relative to a horizontal, wherein the filtered set of data is obtained for the 0° angle by:

a) obtaining a first set of first and third previous pixel locations, a first pixel location and a first and third next pixel locations adjacent to a first side of the pixel location along a current angle relative to the horizontal;

b) obtaining a second set of first and third previous pixel locations, a second pixel location and a first and third next pixel locations adjacent to a second side of the pixel location along the current angle relative to the horizontal;

c) multiplying the third previous pixel location of the first set by 0.032892;

d) multiplying the first previous pixel location of the first set by -0.284054;

halving the first pixel location;

e) multiplying the first next pixel location of the first set by -0.284054;

f) multiplying the third next pixel location of the first set by 0.032892;

g) summing up the multiplied pixel locations of the first set resulting in a first high pass filter output;

h) multiplying the second previous pixel location of the second set by 0.032892;

i) multiplying the first previous pixel location of the second set by -0.284054;

j) halving the first pixel location;

k) multiplying the first next pixel location of the second set by -0.284054;

l) multiplying the third next pixel location of the second set by 0.032892;

m) summing up the multiplied pixel locations of the second set resulting in a second high pass filter output; and

n) averaging the magnitude of the first and second high pass filter outputs resulting in a final highpass filter output for the current angle.

9. (Original) A system for the detection of image feature edges comprising:

a) a lowpass filter responsive to a first , second, third and fourth vertically aligned luma data sample rows and operative to develop a first, second, third and fourth low pass filtered luma data samples;

b) a two-dimensional pixel storage array responsive to the first, second, third and fourth lowpass filtered luma data samples and operative to develop a two-dimensional array of pixel data;

c) a first horizontal halfband highpass filter receptive to the second and third lowpass filtered luma data samples and operative to develop a first horizontal highpass filtered luma data sample;

d) a second horizontal halfband highpass filter receptive to the second and third vertically aligned luma data sample rows and operative to develop a second horizontal highpass filtered luma data sample;

e) a luma maximum/minimum/delta calculation module receptive to the two-dimensional array of pixel data and operative to develop a minimum/maximum/delta;

f) a directional halfband highpass filter array receptive to the two-dimensional array of pixel data and operative to develop a set of directional highpass filter outputs;

g) a first horizontal lowpass filter receptive to the first horizontal highpass filtered luma data sample and operative to develop a first horizontal lowpass filtered luma data sample;

h) a second horizontal lowpass filter receptive to the second horizontal highpass filtered luma data sample and operative to develop a second horizontal lowpass filtered luma data sample;

i) an above/below filter pair output averaging module responsive to the highpass filter outputs and operative to develop a set of pair-averaged filter output magnitudes;

j) an edge maximum/minimum calculation module responsive to the set of pair-averaged filter output magnitudes and operative to develop a too many maximums signal, a minimum-maximum/too close signal, an edge minimum signal, a minimum edge threshold signal and a too many minimums signal;

k) an edge direction calculation module responsive to the minimum/maximum/delta, the set of pair-averaged filter outputs, the too many maximums signal, the minimum-maximum/too close signal, the edge minimum signal, the minimum edge threshold signal, the too many minimums signal, the first horizontal lowpass filtered luma data sample and the second horizontal lowpass filtered luma data sample and operative to develop an edge direction; and

l) a post-detection filter array responsive to the edge direction and operative to develop a final edge direction.

10. (Original) The system of claim 9 wherein the post-detection filter array is comprised of:

a) a two-dimensional statistical filter responsive to the edge direction and operative to develop a first filtered edge direction;

b) a non-linear edge smoothing filter responsive to the first filtered edge direction and operative to develop a second filtered edge direction;

c) a 15° angle enhancement filter responsive to the second filtered edge direction and operative to develop a third filtered edge direction; and

d) a single-pixel edge removal filter responsive to the third filtered edge direction and operative to develop the final edge direction.

11. (Original) The system of claim 9 wherein the edge maximum/minimum calculation module comprises:

a) a maximum detection responsive to the set of pair-averaged filter output magnitudes and operative to develop a maximum edge value;

b) a maximum edge threshold calculation responsive to the maximum edge value and a first threshold value and operative to develop a maximum edge threshold value;

c) a too many maximums detection responsive to the set of pair-averaged filter output magnitudes and the maximum edge threshold value and operative to develop the too many maximums signal;

d) a minimum detection responsive to the set of pair-averaged filter output magnitudes and operative to develop the edge minimum signal;

e) a minimum edge threshold calculation responsive to the edge minimum signal and a second threshold value and operative to develop the minimum edge threshold signal;

f) a too many minimums detection responsive to the set of pair-averaged filter output magnitudes and the minimum edge threshold signal and operative to develop the too many minimums signal; and

g) a minimum/maximum too close calculation module responsive to the maximum edge value, the edge minimum signal and a third threshold value and operative to develop the minimum-maximum/too close signal.

12. (Original) The system of claim 9 wherein the edge direction calculation module determines the edge direction is not a valid edge if the too many maximums signal, the minimum-maximum/too close signal or the too many minimums signal is received from the edge maximum/minimum calculation module.

13. (Original) The system of claim 12 wherein the edge direction calculation module determines the edge direction is not a valid edge if the edge minimum signal is greater than about a threshold value which is proportional to a luma delta component of the minimum/maximum/delta.

14. (Original) The system of claim 13 wherein the edge direction calculation module inhibits the selection of a -45°, a -30°, a -15°, a 15°, a 30° and a 45° edge direction if the first horizontal lowpass filtered luma data sample and the second horizontal lowpass filtered luma data sample are greater than about a first threshold.

15. (Original) The system of claim 14 wherein the edge direction calculation module has received no indication of a non-valid edge from the edge maximum/minimum calculation module and no more than two of the set of pair-averaged filter outputs are greater than about the minimum edge threshold signal then the edge direction is determined to be:

a) 0° if a -15° and a 15° filter output selected from the set of pair-averaged filter outputs are below about the minimum edge threshold signal; or

b) 15° if a 0° and a 30° filter output selected from the set of pair-averaged filter outputs are below about the minimum edge threshold signal; or

c) 15° if the 15° filter output selected from the set of pair-averaged filter outputs is below about the minimum edge threshold signal and a 90°, a -60°, a 60° and a -45° filter outputs selected from the set of pair-averaged filter outputs are above about the minimum edge threshold signal; or

d) -15° if the 0° and a -30° filter output selected from the set of pair-averaged filter outputs are below about the minimum edge threshold signal; or

e) -15° if the -15° filter output selected from the set of pair-averaged filter outputs is below about the minimum edge threshold signal and the 90°, the -60°, the 60° and the +45° filter outputs selected from the set of pair-averaged filter outputs are above about the minimum edge threshold signal; or

f) 0° if the 0° filter output selected from the set of pair-averaged filter outputs is equal to the edge minimum signal and the 90°, the -60° and the 60° filter outputs selected from the set of pair-averaged filter outputs are above about the minimum edge threshold signal; or

g) 30° if the 30° filter output selected from the set of pair-averaged filter outputs is equal to the edge minimum signal and the -30°, the -45° and the -60° filter outputs selected from the set of pair-averaged filter outputs are above about the minimum edge threshold signal; or

h) -30° if the -30° filter output selected from the set of pair-averaged filter outputs is equal to the edge minimum signal and the 30°, the 45° and the 60° filter outputs selected from the set of pair-averaged filter outputs are above about the minimum edge threshold signal; or

i) 45° if the 45° filter output selected from the set of pair-averaged filter outputs is equal to the edge minimum signal and the -30°, the -45° and the -60° filter outputs selected from the set of pair-averaged filter outputs are above about the minimum edge threshold signal; or

j) -45° if the -45° filter output selected from the set of pair-averaged filter outputs is equal to the edge minimum signal and the 30°, the 45° and the 60° filter outputs selected from the set of pair-averaged filter outputs are above about the minimum edge threshold signal; or

k) 60° if the 60° filter output selected from the set of pair-averaged filter outputs is equal to the edge minimum signal and the -30° and the -45° filter outputs selected from the set of pair-averaged filter outputs are above about the minimum edge threshold signal; or

l) -60° if the -60° filter output selected from the set of pair-averaged filter outputs is equal to the edge minimum signal and the 30° and the 45° filter outputs selected from the set of pair-averaged filter outputs are above about the minimum edge threshold signal; or

m) 90° if the 90° filter output selected from the set of pair-averaged filter outputs is equal to the edge minimum signal and the -30°, the -45°, the 30° and the 45° filter outputs selected from the set of pair-averaged filter outputs are above about the minimum edge threshold signal; or

n) no edge direction is selected if the edge direction calculation module fails to determine a valid edge direction.

16. (Original) The system of claim 10 wherein the first filtered edge direction is determined by:

a) obtaining a two-dimensional array of edge detection values centered around a current edge detection value;

b) determining a set of dissimilar edge detection values and a set of similar edge detection values based on the two-dimensional array of edge detection values;

c) assigning a proximity-weighted value for each of the individual dissimilar and similar edge detection values;

d) calculating a first sum of the proximity-weighted values of the individual dissimilar edge detection values;

e) calculating a second sum of the proximity-weighted values of the individual similar edge detection values minus a constant; and

f) determining that a valid edge direction does not exist if the first sum is greater than about the second sum minus a predetermined constant value and the first sum is greater than about a predetermined threshold.

17. (Original) The system of claim 16 wherein the second filtered edge direction is determined by:

a) obtaining the immediately left and an immediately right edge detection value relative to the current edge detection value;

b)if the immediate left and the immediate right edge detection values are equal, the current edge detection value is set to a value equal to the immediate left and immediate right edge detection values; and

c) if the immediate left and the immediate right edge detection values are from a set of adjacent edges and the current edge detection value is not from the set of adjacent edges, the current edge detection value is set equal to the immediate left edge detection value.

18. (Original) The system of claim 17 wherein the third filtered edge direction is determined by:

a) obtaining the immediately left and the immediately right edge detection value relative to the current edge detection value;

b) if the immediate left or the immediate right edge detection values are 15° and a current edge direction value is 0° or none, the current edge direction value is set to 15°; and

c) if the immediate left or the immediate right edge detection values are -15° and a current edge direction value is 0° or none, the current edge direction value is set to -15°.

19. (Original) The system of claim 18 wherein the final edge direction is determined by removing a set of any remaining single pixel wide edge detection values.

20. (Original) The system of claim 9 wherein the lowpass filter is a horizontal lowpass filter.

21. (Original) The system of claim 9 wherein the lowpass filter is a vertical lowpass filter.

22. (Original) A system for an edge-based pixel calculation comprising:

a) a two-dimensional pixel storage array responsive to a set of current field chroma/luma data and a final edge direction and operative to develop a two-dimensional array of pixel data, a flat/horizontal edge direction indication and an edge direction;

b) a directional pixel calculation module responsive to the two-dimensional array of pixel data and the flat/horizontal edge direction indication and operative to develop a set of directional calculated pixels; and

c) a calculated pixel selection module responsive to the set of directional calculated pixels, the edge direction, a pixel from a previous field and a motion detection signal and operative to develop a final directional pixel.

23. (Original) The system of claim 22 wherein the calculated pixel selection module is comprised of:

a) a multiplexer responsive to the set of directional calculated pixels and the edge direction and operative to develop a directional calculated pixel; and

b) a mixing circuit responsive to the directional calculated pixel, the pixel from a previous field and the motion detection signal and operative to develop the final directional pixel.

24. (Currently amended) An image feature edge detector comprising:

a horizontal filter means receptive to a vertically aligned luma data stream and providing a filtered luma data stream wherein the vertically aligned luma data stream are from a temporally current field;

an edge direction calculation means receptive to the filtered luma data stream and providing an indication of an edge direction; and

a post-detection filter array means receptive to the indication of the edge direction and providing a final indication of an edge direction.